FLOOD INSURANCE STUDY

WARRICK COUNTY, INDIANA
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BOONVILLE, CITY OF	180273
CHANDLER, TOWN OF	180274
ELBERFELD, TOWN OF*	180275
LYNNVILLE, TOWN OF	180339
NEWBURGH, TOWN OF	180276
TENNYSON, TOWN OF	180350
WARRICK COUNTY, UNINCORPORATED AREAS	180418

*No Special Flood Hazard Areas Identified

PRELIMINARY:

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
18173CV000A

NOTICE TO FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) report may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

The Federal Emergency Management Agency (FEMA) may revise and republish part or all of this FIS report at any time. In addition, FEMA may revise part of this FIS report by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. Therefore, users should consult with community officials and check the Community Map Repository to obtain the most current FIS report components.

Former flood insurance risk zone designations have been changed as follows:

Old Zone	New Zone
A1 through A30	AE
V1 through V30	VE
B	X
C	X

Effective Date:

Revised Dates:

TABLE OF CONTENTS

FIGURES

TABLES

TABLE OF CONTENTS (continued)

EXHIBITS

Exhibit 1 - Flood Profiles

Exhibit 2 - Flood Insurance Rate Map Index

Flood Insurance Rate Map

FLOOD INSURANCE STUDY

WARRICK COUNTY, INDIANA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and supercedes the FIS reports and Flood Insurance Rate Maps (FIRMs) in the geographic area of Warrick County, Indiana, including the City of Boonville, the Towns of Chandler, Elberfeld, Lynnville, Newburgh, Tennyson, and the unincorporated areas of Warrick County (hereinafter referred to collectively as Warrick County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. This information will also be used by Warrick County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP) and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

The Digital Flood Insurance Rate Map (DFIRM) and FIS report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and Geographic Information System (GIS) format requirements. The flood hazard information was created and is provided in a digital format so that it can be incorporated into local GIS and be accessed more easily by the community.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Information of the authority and acknowledgements for each of the new studies and previously printed FIS reports and Flood Insurance Rate Maps (FIRMs) for communities within Warrick County was compiled and is shown below:

City of Boonville: The previously effective FIS for the City of Boonville is dated November 17, 1981. The hydrologic and hydraulic analyses for this study were performed by the American Consulting Engineers, Inc. for the Federal Insurance Administration, under Contract No. H-4773. This study was completed in August 1980.

Town of Newburgh: The previously effective FIS for the Town of Newburgh is dated November 17, 1981. The hydrologic and hydraulic analyses for this study were performed by American Consulting Engineers, Inc. for the Federal Emergency Management Agency, under Contract No. H-4773. This study was completed in June 1980.

Warrick County (Unincorporated Areas): The previously effective FIS for the County of Warrick is dated February 3, 1993. The hydrologic and hydraulic analyses for this study were performed by American Consulting Engineers, Inc. for the Federal Emergency Management Agency, under Contract No. H-4733. This study was completed in September 1980.

New Studies: The hydrologic and hydraulic analysis for approximate stream reaches of Warrick County were performed by Christopher B. Burke Engineering, Ltd., on behalf of the Indiana Department of Natural Resources, under Indiana Public Works Project Number E400203. The new studies also include leverage studies analyzed by detailed methods by VS Engineering and corrected by the Indiana Department of Natural Resources. The Indiana Department of Natural Resources managed the production of these studies as part of their Cooperating Technical Partner agreement with the Federal Emergency Management Agency dated April 29, 2004, which was defined by the Indiana DNR Mapping Activity Statement 05-14 dated June 23, 2005 and funded under agreement number EMC-2005-GR-7022.

Redelineation of the previously effective flood hazard information for this FIS report was performed by Christopher B. Burke Engineering, Ltd., on behalf of the Indiana Department of Natural Resources, under Indiana Public Works Project Number E400203. Correction to the North American Vertical Datum of 1988 and conversion of the unincorporated and incorporated areas of Warrick County into the countywide

format was performed by the Indiana Department of Natural Resources. The Indiana Department of Natural Resources managed the production of this study as part of their Cooperating Technical Partner agreement with the Federal Emergency Management Agency dated April 29, 2004, which was defined by the Indiana DNR Mapping Activity Statement 05-14 dated June 23, 2005 and funded under agreement number EMC-2005-GR-7022.

The coordinate system used for the production of the digital FIRMs is the Transverse Mercator projection, Indiana State Plane coordinate system, West Zone, referenced to the North American Datum of 1983 and the GRS 1980 spheroid.

1.3 Coordination

The purpose of an initial Consultation Coordinated Officer's (CCO's) meeting is to discuss the scope of the FIS. A final CCO meeting is held to review the results of the study. The dates of the initial and final CCO meetings held for the previously effective FIS reports covering the geographic area of Warrick County, Indiana are shown in Table 1. The initial and final CCO meetings were attended by the study contractor, FEMA (or the Federal Insurance Administration), the Indiana Department of Natural Resources (IDNR), and the affected communities.

TABLE 1 - CCO MEETING DATES FOR PRE-COUNTYWIDE FIS

Community Name	Initial CCO Date	Final CCO Date
Boonville, City of	April 1978	June 19, 1981
Newburgh, Town of	April 1978	June 19, 1981
Warrick County	April 1978	June 19, 1981

For this countywide FIS, an initial CCO meeting was held on March 15, 2005 and was attended by IDNR the Warrick County Soil and Water Conservation District, and representatives from the City of Boonville, the Towns of Chandler and Newburgh, and Warrick County.

The results of the countywide study were reviewed at the final CCO meeting held on , and attended by representatives of FEMA, IDNR and . All problems raised at that meeting have been addressed.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Warrick County, Indiana, including the incorporated communities listed in Section 1.1

All FIRM panels for Warrick County have been revised, updated, and republished in countywide format as a part of this FIS. The FIRM panel index, provided as Exhibit 2, illustrates the revised FIRM panel layout.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards as identified during the initial CCO meeting. For this study, five (5) new stream reaches were studied using approximate methods. The scope and methods of new approximate studies were proposed and agreed upon by FEMA, the IDNR, and Warrick County. The streams studied by approximate methods are listed in Table 3.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction through September 1985 for the currently effective FIS stream reaches, and through 1997 for the newly studied leverage study stream reaches. The streams studied by detailed methods are listed in Table 2. Four (4) new leverage study stream reaches analyzed by detailed methods are included in this FIS update. The scope and methods of new approximate and detailed studies were proposed and agreed upon by FEMA, the IDNR, and Warrick County. The scope of study for the selected streams is listed in Table 4.

This FIS update also incorporates the determination of letters issued by FEMA resulting in map changes (Letters of Map Change, or LOMCs). No LOMCs have been incorporated into the mapped changes. No Letters of Map Revision (LOMRs) have been issued for Warrick County. Letters of Map Amendment (LOMAs) revalidated for this study are summarized in the Summary of Map Actions (SOMA) included in the Technical Support Data Notebook (TSDN) associated with this FIS update. Copies of the TSDN may be obtained from the Community Map Repository.

TABLE 2 – STREAMS STUDIED BY DETAILED METHODS

Bluegrass Creek	Ohio River
Cypress Creek	Pigeon Creek
Edwards Ditch - Weinsheimer Ditch	Stollberg Ditch
Kelly Ditch	Summer Pecka Ditch
Little Pigeon Creek	Whittaker Ditch

TABLE 3 – STREAMS STUDIED BY APPROXIMATE METHODS

Big Creek	Edwards Ditch
Bluegrass Creek	Pigeon Creek
Cypress Creek	Squaw Creek

TABLE 4 – SCOPE OF STUDY

Stream	Limits of Detailed Study
Cypress Creek	River mile 12.4 to 14.9
Cypress Creek	Within Boonville City limits
Edwards/ Weinsheimer Ditch	Mouth to CR 900 W Road
Kelly Ditch	Mouth to CR 400 W
Little Pigeon Creek	Mouth to CR 525 E Road
Ohio River	Within county
Pigeon Creek	Vanderburgh County boundary to North 250 Road
Stollberg Ditch	Mouth to upstream of Whittaker Ditch
Summer Pecka Ditch	CR 500 S to SR 66
Whittaker Ditch	CR 725 W to Greenwood Road
Stream	**Limits of Approximate Study**
Big Creek	Gibson County boundary to SR 68
Edwards Ditch	CR 900 W to CR 850 W
Pigeon Creek	Above Squaw Creek to Gibson County boundary
Pigeon Creek	Vanderburgh Co. boundary to Vanderburgh Co. boundary
Squaw Creek	Above CR 700 W to 0.8 miles above CR 400 N

2.2 Community Description

Warrick County is located approximately 130 miles southwest of Indianapolis in southwestern Indiana. Warrick County is bordered on the south by the Ohio River and the Counties of Henderson and Daviess, Kentucky, on the west by Vanderburgh County and the City of Evansville, on the North by Pike County, Gibson County and Dubois County, and on the east by Spencer County. The Ohio River is a major U.S. transportation route from Pittsburgh to the Gulf of Mexico. Other transportation routes within Warrick County include Interstate Highway 64 and Norfolk Southern

and Indiana Southern Railway. According to STATS Indiana, the population of Warrick County in 2005 was reported to be 57,090.

The climate of the area is characterized by warm, humid summers and moderately cold winters with a wide range of temperature variation. According to the National Oceanic and Atmospheric Administration (NOAA), average daily temperatures for Warrick County range from 76 degrees Fahrenheit (F) in the summer to 35 degrees Fahrenheit (F) in the winter. For the period of record between 1971 and 2000, the annual average precipitation was approximately 47.2 inches.

The topography of the area varies from nearly level bottom lands to rolling and somewhat hilly uplands. Surface and near surface geological ages represented in the area are the Quaternary period and the bedrock formations. Bedrock consists of strata of Pennsylvanian age. Sandstone, shale and limestone outcrop in nearly all parts of the state. There are also various coal outcrops (Reference 3). Vegetation within the area is mostly crops.

Much of the existing development is above the 1 Percent-Annual-Chance-flood elevation of the streams and rivers studied signifying an appreciation of the flood potential of Cypress Creek, Pigeon Creek, Edwards Ditch - Weinsheimer Ditch and the Ohio River. The possibility also exists of the flooding of Pigeon Creek and Edwards Ditch - Weinsheimer Ditch from Ohio River backwater. The natural topography provides natural drainage to Cypress Creek and Pigeon Creek, which drain in a southwesterly direction to the Ohio River. Edwards Ditch - Weinsheimer Ditch drains north into Pigeon Creek.

Land use within the flood plain of Cypress Creek is primarily agricultural with the exception of park and residential areas near the City of Boonville. Land use within the flood plains of Pigeon Creek, Edwards Ditch - Weinsheimer Ditch, Kelly Ditch, and Stollberg Ditch are agricultural and residential. Land use within the flood plains of Summer Pecka Ditch and Whittaker Ditch are primarily agricultural and residential with some strip mined areas present. The Ohio River flood plain is agricultural with the exception of the industrial area near Yankeetown and the residential areas near Newburgh.

The City of Boonville, the Warrick County seat, is located in southwestern Indiana about 17 miles east of Evansville and 135 miles southwest of Indianapolis. Boonville is located along the bank of Cypress Creek, in central Warrick County surrounded by unincorporated areas of Warrick County. According to STATS Indiana, the population of Boonville was 6,782 in 2005.

The Town of Chandler is located in western Warrick County. According to STATS Indiana, the population of Chandler was 3,065 in 2005.

The Town of Elberfeld is located in northwestern Warrick County. According to STATS Indiana, the population of Elberfeld was 648 in 2005.

The Town of Lynnville is located in northern Warrick County. According to STATS Indiana, the population of Lynnville was 819 in 2005.

The Town of Newburgh is in southwestern Indiana, in southern Warrick County, about 9 miles east of Evansville and 11 miles southwest of Boonville, the Warrick County seat. The Town of Newburgh is bordered on three sides by Warrick County, and on the south by Henderson County, Kentucky. Newburgh is along the north bank of the Ohio River, on the Indiana-Kentucky state line. According to STATS Indiana, the population of Newburgh was 3,298 in 2005.

The Town of Tennyson is located in eastern Warrick County. According to STATS Indiana, the population of Tennyson was 302 in 2005.

2.3 Principal Flood Problems

The history of flooding on Cypress Creek indicates that the major floods occurred during January, February, March, April, and May, and usually the result of spring rains and/or snowmelts. There also exists the possibility of flash flooding from localized heavy thunderstorms during the hot, humid months. The origin and general nature of the flooding is typified by the occurrences of 1937, 1961, and 1964. Cypress Creek can be bank full by Ohio River backwater alone (no precipitation in Warrick County area) as on January 31, 1937, at six p.m. when the Ohio River reached its highest crest at Cypress Creek (crest elevation 386.8 feet National Geodetic Vertical Datum (NGVD29)) (Reference 3). The majority of the floods on Cypress Creek, however, occur by headwater alone as in the May 11, 1961 storm. Floods may also be caused by a combination of headwater and Ohio River backwater as in the March 1964 flood.

Damage from flooding along Pigeon Creek and Edwards Ditch - Weinsheimer Ditch, which floods primarily from Pigeon Creek backwater, occurs when the Pigeon Creek headwater becomes sufficiently high to overflow the channel, as in the May 11, 1961 flood. Pigeon Creek and Edwards Ditch - Weinsheimer Ditch may also become bank full from Ohio River backwater alone as on February 1, 1937 at 1 a.m., when the Ohio River crested at the mouth of Pigeon Creek (Reference 3). Pigeon Creek and Edwards Ditch - Weinsheimer Ditch may also flood from a combination of both Ohio River backwater and Pigeon Creek headwater as in the March 1964 flood. The study of Edwards Ditch - Weinsheimer Ditch showed that only a small portion of the ditch within the detailed study area is not controlled by Pigeon Creek backwater. However, Edwards Ditch - Weinsheimer Ditch may flood from headwater alone, but the most threatening and more severe floods are caused by Pigeon Creek backwater. There are no records found to be kept on Edwards Ditch - Weinsheimer Ditch. The flooding problem in the Pigeon Creek and Edwards Ditch - Weinsheimer Ditch area consists principally of overflow onto agricultural land.

The history of flooding on the Ohio River indicates that flooding may occur during any season of the year. The majority of the major floods occurred during January, February, March and April. The primary factor contributing to flooding is the geographical location of the basin with respect to continental meteorological conditions. This geographical location is such that practically all of its area lies within a belt of frequent and prolonged periods of copious rains, which, particularly in the winter and the spring, extend from Texas to New England directly over the long axis of the basin (Reference 3).

There have been numerous floods on the Ohio River. Incomplete records exist back to January 9, 1762, on portions of the Ohio. Systematic records were begun in 1870, and 16 severe floods had occurred by 1938. The criteria for severe flooding is five feet above its natural banks.

On January 31, 1937, at 6 p.m., the Ohio River reached its highest crest at Newburgh. The stage was approximately 18.6 feet above flood stage (crest elevation 387.2 feet NGVD29). The second greatest flood occurred in April 1913 at 381.7 feet NGVD (Reference 4). Four major floods have occurred since 1937; March 1945, March 1964, January 1950, and April 1948. The 1945 flood and 1913 floods are considered to be very near a rare occurrence. These historical flood events occurred prior to major upstream reservoirs construction.

2.4 Flood Protection Measures

Numerous flood protection and flood reduction projects have been completed within the Ohio River basin above Newburgh. This study represents the group "A" reservoirs (1976 update). Group "A" reservoirs refer to reservoirs which fall under the category of completed, under construction, or in the advanced design stages. The reservoirs reduce the natural average drainage along the Ohio River by 50 percent.

These reservoirs provide substantial protection to the cities along the Ohio River by reducing the stage height and frequency of floods along the banks. In 1976, the COE completed the Newburgh Bank Protection project which prevents stream bank erosion and does not protect the adjacent areas from flooding. This project was done in consolidation with the Newburgh This project was done in consolidation with the Newburgh Lock and Navigation Dam project (Reference 5).

There are no major flood protection or reduction projects or facilities on Cypress Creek, Pigeon Creek, and Edwards Ditch - Weinsheimer Ditch.

In 1976, the COE completed the Newburgh Bank Protection project which consisted of 1.1 miles of bank revetment. The protection that bank revetment provides is only against erosion rather than floods. The project was done in consolidation with the Newburgh Lock and Navigation Dam project (Reference 5).

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in Warrick County, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analysis

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting Warrick County.

Table 5 contains a summary of peak discharges for the 10%-, 2%-, 1%-, and 0.2%-annual chance floods, where applicable, for each flooding source studied in detail in Warrick County.

TABLE 5 – SUMMARY OF DISCHARGES

Flooding Source And Location	Drainage Area (Square Miles)	Percent-Annual-Chance-Flood Peak Discharge (CFS) 10 Percent	2 Percent	1 Percent	0.2 Percent
BLUEGRASS CREEK					
At mouth	44.5	*	*	5,000	*
At North 100 Road	36.2	*	*	4,550	*
At Boonville Road	21.3	*	*	3,550	*
At North 600 Road	7.0	*	*	2,160	*
At Conrail	4.8	*	*	1,710	*
At North 750 Road	3.2	*	*	1,470	*
At North 800 Road	2.0	*	*	1,120	*
CYPRESS CREEK					
About 1.4 miles upstream of South 150 Road	17.55	1,850	2,760	3,200	4,300

TABLE 5 – SUMMARY OF DISCHARGES (CONTINUED)

At North 250 Road	9.48	1,390	2,050	2,330	3,200
About 500 feet downstream of State Route 62	14.89	1,470	2,200	2,550	3,425
About 0.1 miles upstream of State Route 62	10.83	1,470	2,200	2,550	3,425
About 0.45 miles upstream of State Route 62	9.82	1,400	2,100	2,410	3,200
EDWARDS DITCH - WEINSHEIMER DITCH					
At Southern Railway	13.99	1,650	2,470	2,870	3,850
About 0.4 miles upstream of South 300 Road	1.75	610	900	1,060	1,390
KELLY DITCH					
At Mouth	3.33	720	1,180	1,440	1,646
About 2400’ downstream of CR 400 W	2.34	540	880	1,080	1,352
LITTLE PIGEON CREEK					
At mouth	400	9,200	10,500	10,600	21,000
OHIO RIVER					
Newburgh	97,000	660,000	820,000	885,000	1,035,000
PIGEON CREEK					
About 1.0 mile downstream of West 1025 Road	244.45	7,000	10,900	12,500	17,000
About 2.5 miles upstream of North 50 Road	211.44	6,190	9,800	11,300	15,300
STOLLBERG DITCH					
About 210’ upstream of mouth	2.58	596	1,014	1,221	*
SUMMER PECKA DITCH					
Mouth at Cypress Creek	4.70	947	1,509	1,805	*
About 1400’ downstream Of CR 600 W	3.56	731	1,177	1,406	*
WHITTAKER DITCH					
Mouth at Stollberg Ditch	1.11	274	472	557	*

* - Data Not Available

Standard and accepted hydrologic methods were used to develop discharge data on the study streams in Warrick County.

No existing U.S. Geological Survey (USGS) gaging stations are located on the Bluegrass Creek or its tributaries. Therefore, a regional study using surrounding USGS gaging stations was preformed to develop a discharge-drainage area frequency curve. Flood-flow frequency data at all gages were determined using USGS guidelines (Reference 6). In addition, an analysis using the SCS unit-hydrograph method for surrounding basins, available from a previous study, was incorporated into this regional frequency study. The SCS method is based on a dimensionless unit hydrograph, with drainage area, duration of rainfall, and time to peak as parameters.

The discharges for the Ohio River were prepared by the US Army Corps of Engineers (USACE) (Reference 4). The discharges used for the Ohio River were obtained by the reservoir routing method and considered the flood flow reduction of the group "A" reservoirs (1976 update). Group "A" reservoirs fall under the category of completed, under construction, or in advance design stages. For Cypress Creek and Edwards Ditch - Weinsheimer Ditch, the drainage basin was analyzed by three methods, the SCS Unit Hydrograph method (Reference 7), the USGS 710 method (Reference 8), and Bureau of Public Roads' method (Reference 9). The Kelly Ditch, Whittaker and Stollberg Ditch, and Summer Pecka Ditch, the drainage basins were analyzed by VS Engineering using the SCS Unit Hydrograph method.

The Pigeon Creek drainage basin was analyzed using two methods, the USGS Circular 710 method (Reference 8) and the log-Pearson Type III method (Reference 5). The log-Pearson Type III discharge values were selected as best representing the Pigeon Creek drainage basin. The data for log-Pearson Type III analysis was based on stage records covering a 17-year period at the gaging station near Evansville, Indiana. The SCS, the USGS, the USACE, and the Indiana DNR mutually coordinated the discharge frequency values used for Cypress Creek, Pigeon Creek, Edwards Ditch - Weinsheimer Ditch, and Kelly Ditch in this study. The discharge-frequency relationships for Little Pigeon Creek were taken from Unincorporated Areas of Spencer County Flood Insurance Study (Reference 10). The discharge-frequency relationships for Whittaker and Stollberg Ditch, and Summer Pecka Ditch were taken from flood frequency analyses performed by VS Engineering and approved by the IDNR.

3.2 Hydraulic Analysis

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the Flood Insurance

Rate Map (FIRM) represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data table in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS report in conjunction with the data shown on the FIRM.

Locations of selected cross sections used in the hydraulic analyses are shown in the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map. Cross-section data was obtained by field surveying and supplemented with USGS quadrangle mapping and aerial photography. Field surveying for Cypress Creek, Pigeon Creek, and Edwards Ditch - Weinsheimer Ditch was performed in 1978 and 1979. Field survey for Kelly Ditch, Whittaker and Stollberg Ditch, and Summer Pecka Ditch was performed by VS Engineering in 1997.

Water-surface elevations for floods of the selected recurrence intervals were computed through use of the USACE HEC-2 step-backwater computer program for all detailed stream lengths except the Ohio River. Weir-flow and split-flow computations were performed at locations where road overflow occurred. For the Ohio River and new approximate study reaches, the USACE HEC-RAS program was used (Reference 19).

Flood profiles were prepared for all streams studied by detailed methods and show computed water-surface elevations for floods of the selected recurrence intervals. For this countywide FIS, flood profiles and approved LOMRs have been consolidated into continuous stream reaches and adjusted to reflect the current vertical datum as described in Section 3.3. In cases where the 2 Percent-Annual-Chance and 1 Percent-Annual-Chance flood elevations are close together, due to limitations of the profile scale, only the 1 Percent-Annual-Chance profile has been shown.

Starting water surface elevations for Bluegrass Creek, Cypress Creek, Edwards Ditch - Weinsheimer Ditch, Kelly Ditch, Summer Pecka Ditch, and Stollberg Ditch were calculated by slope-area method. Starting water surface elevations for the Ohio River were based on the slope-area method taken below the Uniontown Dam 846. The backwater elevation of Pigeon Creek was determined from the Flood Insurance Study for Vanderburgh County, Indiana (Reference 24). The starting water surface elevation for Whittaker Ditch was based on a known water surface elevation of Stollberg Ditch.

Channel and overbank roughness factors (Manning's "n" values) used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the stream and floodplain areas. Channel and overbank roughness factors used in the detailed studies are summarized by stream in Table 6.

TABLE 6 – MANNING'S "N" VALUES

Stream	Roughness Coefficients Main Channel	Overbanks
Bluegrass Creek	0.040 – 0.070	0.045 – 0.080
Cypress Creek	0.080	0.050 - 0.100
Pigeon Creek	0.050 - 0.062	0.060 - 0.080
Edwards Ditch - Weinsheimer Ditch	0.040	0.050 – 0.07 0
Kelly Ditch	0.05	0.060 - 0.07 0
Ohio River	0.020 - 0.034	0.029 – 0.085
Summer Pecka Ditch	0.032 – 0.060	0.060 – 0.080
Stollberg Ditch	0.055 – 0.060	0.065 – 0.070
Whittaker Ditch	0.055	0.07

For new approximate study areas, analyses were based on field inspection and modeling of the stream reaches using simplified HEC-RAS models. Structural measurements or field surveying was not performed. Cross section geometry was derived from USGS topographic mapping with a maximum spacing of 490 feet. Starting elevations were assumed to be normal depth.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD29). With the finalization of the North American Vertical Datum of 1988 (NAVD88), many FIS reports and FIRMs are being prepared using NAVD88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD88. Structure and ground elevations in the community must, therefore, be referenced to NAVD88. It is important to note that adjacent communities may be referenced to NGVD29. This may result in differences in Base Flood Elevations (BFEs) across the corporate limits between the communities. In this revision, a vertical datum conversion of -0.33 foot was calculated at the centroid of the county and used to convert all elevations in Warrick County from NGVD29 to NAVD88 using the National Geodetic Survey's VERTCON online utility (VERTCON, 2005).

For more information on NAVD88, see the FEMA publication entitled Converting the National Flood Insurance Program to the North American Vertical Datum of 1988 (FEMA, June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance flood elevations and delineations of the 1- and 0.2-percent-annual-chance floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, and the Floodway Data table. Users should reference the data presented in the FIS report as well as additional information that may be available at the local map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using USGS topographic maps.

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM (Exhibit 2). On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, V, and VE); and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual chance floodplain boundary is shown on the FIRM (Exhibit 2).

4.2 Floodways

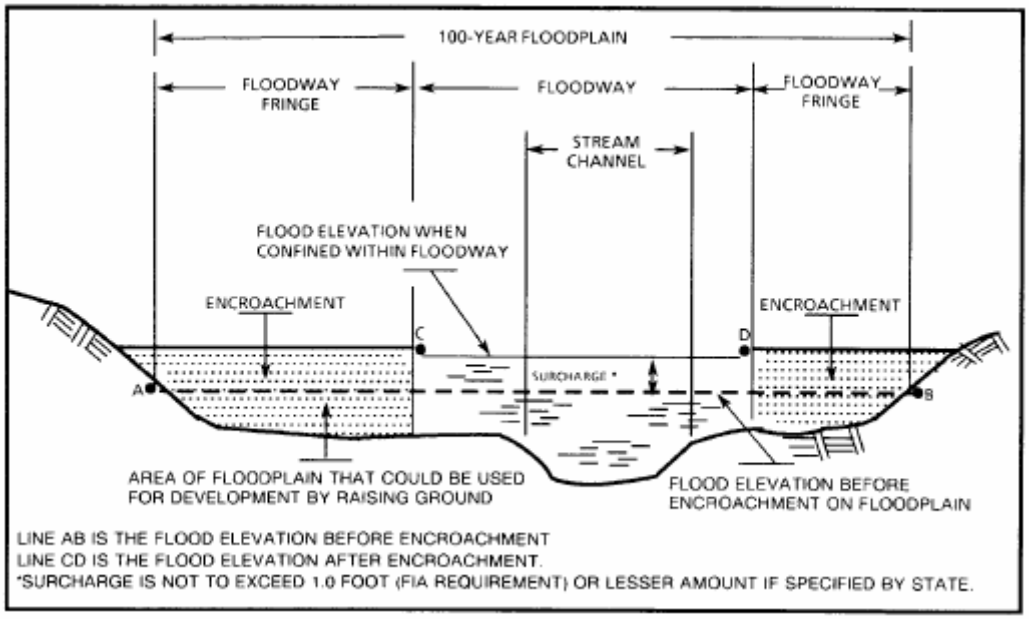
Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The State of Indiana, however, per Indiana Code IC 14-28-1 and Indiana Administrative Code 312 IAC 10, has designated that encroachment in the floodplain is limited to that which will cause no significant increase in flood height. As a result, floodways for this study are delineated based on a flood surcharge of less than 0.15 feet. The floodways in this study were approved by the IDNR and are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this FIS report and on the FIRM were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations have been tabulated for selected cross sections (Table 4). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 1-percent-annual-chance flood more than the allowable flood surcharge limit at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

Figure 1: Floodway Schematic



FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET/ SECOND)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
BLUEGRASS CREEK								
A	0.83	505 / 0[2]	2,238	2.0	384.4	372.0[3]	372.1	0.1
B	1.58	390 / 0[2]	2,240	2.0	384.7	374.8[3]	374.8	0.0
C	2.72	1252 / 400[2]	3,585	1.3	384.7	380.7[3]	380.8	0.1
D	3.19	2776 / 1830[2]	9,004	0.5	384.7	380.9[3]	381.0	0.1
E	4.05	3058 / 1810[2]	6,625	0.5	384.7	381.8[3]	381.8	0.0
F	4.45	2072 / 1820[2]	2,603	1.4	384.7	382.3[3]	382.3	0.0
G	5.13	2260	2,673	1.2	384.7	384.7	384.8	0.1
H	5.58	2097 / 2060[2]	2,513	1.3	386.4	386.4	386.5	0.1
I	5.98	1639	2,249	1.0	387.4	387.4	387.5	0.1
J	6.26	1307	1,269	1.8	388.6	388.6	388.6	0.0
K	6.44	1324	1,554	1.4	389.3	389.3	389.4	0.1
L	6.87	701	1,197	1.7	392.2	392.2	392.2	0.0
M	7.12	1008	1,868	1.0	393.3	393.3	393.4	0.1
N	7.34	983	1,135	1.7	394.3	394.3	394.4	0.1
O	7.72	840	1,290	1.4	396.5	396.5	396.6	0.1
P	7.99	1230	1,922	0.9	398.0	398.0	398.1	0.1
Q	8.15	1300	1,477	1.1	398.4	398.4	398.4	0.0
R	8.43	1200	801	2.0	400.2	400.2	400.2	0.0
S	8.71	1070	1,643	0.8	401.1	401.1	401.2	0.1
T	9.01	1202	864	1.4	402.8	402.8	402.9	0.1
U	9.27	1000	416	2.7	405.6	405.6	405.7	0.1
V	9.49	557	246	4.2	407.5	407.5	407.5	0.0
W	9.62	202	436	2.0	409.0	409.0	409.1	0.1
X	9.82	289	496	1.8	410.1	410.1	410.2	0.1
CYPRESS CREEK								
A	12.52	650	4684	0.5	391.5	391.5	391.5	0.0
B	12.84	750	5890	0.3	391.5	391.5	391.5	0.0
C	13.29	1100	5348	0.5	391.6	391.6	391.6	0.0
D	13.60	425	1937	1.4	391.8	391.8	391.8	0.0
E	13.92	400	2760	0.8	395.6	395.6	395.6	0.0

[1] MILES ABOVE MOUTH

[2] TOTAL WIDTH / WIDTH WITHIN COUNTY BOUNDARY

[3] ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM PIGEON CREEK

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN
(AND INCORPORATED AREAS)

FLOODWAY DATA

BLUEGRASS CREEK - CYPRESS CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1,2]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET/ SECOND)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
CYPRESS CREEK[1]								
F	14.09	600	2585	1.0	395.7	395.7	395.7	0.0
G	14.48	600	3839	0.5	395.9	395.9	395.9	0.0
H	14.69	600	3272	0.6	395.9	395.9	395.9	0.0
I	14.86	500	1720	1.3	396.1	396.1	396.1	0.0
EDWARDS DITCH[2]								
D	3.05	400	2018	1.5	387.7	384.3[4]	384.3	0.0
E	3.30	400	1767	1.8	387.7	384.5[4]	384.5	0.0
F	3.84	400	1445	2.0	387.7	385.1[4]	385.1	0.0
G	4.27	400	1105	2.5	387.7	385.8[4]	385.8	0.0
H	4.53	300	900	2.3	387.7	386.4[4]	386.4	0.0
I	4.97	300	950	1.9	387.7	387.1[4]	387.1	0.0
J	5.16	300	876	2.0	387.7	387.4[4]	387.4	0.0
K	5.46	300	713	2.5	388.0	388.0	388.0	0.0
KELLY DITCH[1]								
A	0.17	372	863	1.7	388.3	385.8[3]	385.9	0.1
B	0.48	500	1388	1.0	388.3	386.8[3]	386.9	0.1
C	0.72	530	818	1.6	388.3	387.7[3]	387.7	0.0
D	0.93	613	1063	1.3	388.9	388.9	388.9	0.0
E	0.99	685	1438	0.8	389.6	389.6	389.6	0.0
F	1.24	1010	1088	1.0	390.2	390.2	390.2	0.0
G	1.45	855	1049	1.0	391.4	391.4	391.4	0.0
H	1.67	287	344	3.1	393.2	393.2	393.2	0.0
I	1.71	335	419	2.6	394.5	394.5	394.6	0.1
J	1.92	250	562	1.9	396.9	396.9	396.9	0.0
K	2.01	160	269	2.7	397.5	397.5	397.5	0.0

[1] MILES ABOVE MOUTH

[2] MILES ABOVE MOUTH OF WEINSHEIMER DITCH

[3] ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM CYPRESS CREEK

[4] ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM PIGEON CREEK

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN
(AND INCORPORATED AREAS)

FLOODWAY DATA

CYPRESS CREEK - EDWARDS DITCH - KELLY DITCH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET/ SECOND)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
LITTLE PIGEON CREEK								
N/A	0.0	N/A	N/A	N/A	383.5	383.5	N/A	N/A
N/A	1.8	N/A	N/A	N/A	383.7	383.7	N/A	N/A
N/A	5.1	N/A	N/A	N/A	384.0	384.0	N/A	N/A
N/A	6.0	N/A	N/A	N/A	384.1	384.1	N/A	N/A
N/A	6.6	N/A	N/A	N/A	384.2	384.2	N/A	N/A
N/A	7.8	N/A	N/A	N/A	384.3	384.3	N/A	N/A
N/A	8.6	N/A	N/A	N/A	384.4	384.4	N/A	N/A
N/A	9.2	N/A	N/A	N/A	384.5	384.5	N/A	N/A
N/A	9.3	N/A	N/A	N/A	384.5	384.5	N/A	N/A
N/A	9.9	N/A	N/A	N/A	384.5	384.5	N/A	N/A
N/A	10.6	N/A	N/A	N/A	384.5	384.5	N/A	N/A
N/A	12.0	N/A	N/A	N/A	384.6	384.6	N/A	N/A
N/A	12.6	N/A	N/A	N/A	384.6	384.6	N/A	N/A
N/A	12.9	N/A	N/A	N/A	384.6	384.6	N/A	N/A
N/A	13.2	N/A	N/A	N/A	384.6	384.6	N/A	N/A
N/A	13.4	N/A	N/A	N/A	384.6	384.6	N/A	N/A
N/A	13.8	N/A	N/A	N/A	384.6	384.6	N/A	N/A
N/A	14.0	N/A	N/A	N/A	384.6	384.6	N/A	N/A
N/A	14.4	N/A	N/A	N/A	384.6	384.6	N/A	N/A
N/A	15.2	N/A	N/A	N/A	384.7	384.7	N/A	N/A
N/A	15.8	N/A	N/A	N/A	384.9	384.9	N/A	N/A
N/A	15.9	N/A	N/A	N/A	385.0	385.0	N/A	N/A
N/A	16.0	N/A	N/A	N/A	385.1	385.1	N/A	N/A
N/A	16.8	N/A	N/A	N/A	386.7	386.7	N/A	N/A
N/A	17.1	N/A	N/A	N/A	386.8	386.8	N/A	N/A
N/A	17.2	N/A	N/A	N/A	386.8	386.8	N/A	N/A
N/A	18.6	N/A	N/A	N/A	389.5	389.5	N/A	N/A
N/A	20.0	N/A	N/A	N/A	389.9	389.9	N/A	N/A
N/A	22.0	N/A	N/A	N/A	390.4	390.4	N/A	N/A
N/A	22.6	N/A	N/A	N/A	390.6	390.6	N/A	N/A
N/A	23.0	N/A	N/A	N/A	390.7	390.7	N/A	N/A
N/A	24.7	N/A	N/A	N/A	391.2	391.2	N/A	N/A

[1] MILES ABOVE MOUTH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1,2]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET/ SECOND)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
OHIO RIVER[1]								
A	780.20	11782 / 285[3]	219126	4.0	380.7	380.8	380.9	0.1
B	779.20	11435 / 180[3]	225460	3.9	381.2	381.2	381.3	0.1
C	778.70	12272 / 170[3]	260836	3.3	381.6	381.6	381.7	0.1
D	778.20	12685 / 205[3]	241072	3.6	381.7	381.7	381.8	0.1
E	777.70	12863 / 210[3]	266520	3.3	381.9	381.9	382.0	0.1
F	777.30	12866 / 140[3]	267352	3.3	381.9	381.9	382.1	0.1
G	773.00	12630 / 925[3]	226723	3.8	383.1	383.1	383.2	0.1
H	772.00	16050 / 2860[3]	252917	3.4	383.4	383.4	383.5	0.1
I	771.00	18476 / 4890[3]	273172	3.2	383.9	383.9	384.0	0.1
J	770.00	19656 / 5100[3]	317297	2.7	384.3	384.3	384.4	0.1
PIGEON CREEK[2]								
A	16.35	700	11302	1.6	386.5	386.5	386.5	0.0
B	16.99	700	11026	1.4	387.1	387.1	387.1	0.0
C	18.13	700	9649	1.5	387.6	387.6	387.6	0.0
D	18.81	700	9172	1.9	387.9	387.9	387.9	0.0
E	19.38	700	8628	2.0	388.1	388.1	388.1	0.0
F	20.44	700	8262	2.1	388.7	388.7	388.7	0.0
G	21.08	700	7440	2.3	389.1	389.1	389.1	0.0
STOLLBERG DITCH[2]								
A	0.19	880	1052	1.2	388.0	378.9[4]	378.9	0.0
B	0.38	775	2152	0.6	388.0	379.2[4]	379.3	0.1
C	0.57	570	1494	0.8	388.0	379.4[4]	379.5	0.1
D	0.64	575	1390	0.9	388.0	379.5[4]	379.6	0.1
E	0.78	560	715	1.7	388.0	379.9[4]	380.0	0.1
F	1.18	475	992	0.4	388.0	383.8[4]	383.9	0.1

[1] MILES BELOW PITTSBURGH
[2] MILES ABOVE MOUTH
[3] TOTAL WIDTH / WIDTH WITHIN COUNTY BOUNDARY
[4] ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM PIGEON CREEK

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN
(AND INCORPORATED AREAS)

FLOODWAY DATA

OHIO RIVER - PIGEON CREEK - STOLLBERG DITCH

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET/ SECOND)	REGULATORY (FEET, NAVD)	WITHOUT FLOODWAY (FEET, NAVD)	WITH FLOODWAY (FEET, NAVD)	INCREASE (FEET)
SUMMER PECKA DITCH								
A	0.23	220	631	2.9	382.5	362.2[2]	362.3	0.1
B	0.59	160	629	2.9	382.5	364.8[2]	364.9	0.1
C	0.90	132	318	5.0	382.5	371.1[2]	371.1	0.0
D	1.35	300	1062	1.5	382.5	380.4[2]	380.5	0.1
E	1.65	950	2089	0.7	382.5	381.0[2]	381.1	0.1
F	1.86	390	730	1.9	382.7	382.7	382.7	0.0
G	1.98	380	1153	1.2	384.8	384.8	384.9	0.1
H	2.25	370	792	1.8	385.8	385.8	385.9	0.1
I	2.35	400	848	1.2	396.4	386.4	386.4	0.0
J	2.40	290	472	2.1	387.1	387.1	387.1	0.0
K	3.11	130	211	3.3	394.9	394.9	395.0	0.1
WEINSHEIMER DITCH								
A	1.22	500	5574	0.7	387.7	382.9[3]	382.9	0.0
B	1.95	400	3061	1.3	387.7	383.8[3]	383.8	0.0
C	2.64	400	2057	1.8	387.7	384.1[3]	384.1	0.0
WHITAKER DITCH								
A	0.16	96	230	2.4	388.0	383.9[3]	384.0	0.1
B	0.19	180	652	0.9	388.0	385.8[3]	385.9	0.1
C	0.36	175	207	2.7	388.0	386.1[3]	386.2	0.1

[1] MILES ABOVE MOUTH

[2] ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM OHIO RIVER

[3] ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM PIGEON CREEK

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN
(AND INCORPORATED AREAS)

FLOODWAY DATA

SUMMER PECKA DITCH - WEINSHEIMER DITCH
WHITTAKER DITCH

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs or base flood depths are shown within this zone.

Zone AE

Zone AE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance risk zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot base flood depths derived from the detailed hydraulic analyses are shown within this zone.

Zone AR

Zone AR is the flood insurance risk zone that corresponds to an area of special flood hazard formerly protected from the 1-percent-annual-chance flood event by a flood-control system that was subsequently decertified. Zone AR indicates that the former flood-control system is being restored to provide protection from the 1-percent-annual-chance or greater flood event.

Zone A99

Zone A99 is the flood insurance risk zone that corresponds to areas of the 1-percent-annual-chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No BFEs or depths are shown within this zone.

Zone V

Zone V is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no BFEs are shown within this zone.

Zone VE

Zone VE is the flood insurance risk zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance risk zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No BFEs or base flood depths are shown within this zone.

Zone X (Future Base Flood)

Zone X (Future Base Flood) is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No BFEs or base flood depths are shown within this zone.

Zone D

Zone D is the flood insurance risk zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance risk zones as described in Section 5.0 and in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use the zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The countywide FIRM presents flooding information for the entire geographic area of Warrick County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 8, "Community Map History."

7.0 OTHER STUDIES

This FIS report either supersedes or is compatible with all previous studies on streams studied in this report and should be considered authoritative for purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Flood Insurance and Mitigation Division, Federal Emergency Management Agency, Region V, 536 S. Clark Street, 6th Floor, Chicago, IL 60605

9.0 BIBLIOGRAPHY AND REFERENCES

1. National Oceanic and Atmospheric Administration, National Climatic Data Center, *Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Days, 1971-2000*, Climatography of the United States No. 81, 2002.
2. "Population Counts, Estimates and Projections", STATS Indiana, Indiana Business Research Center, Indiana University Kelley School of Business, accessed at www.stats.indiana.edu/pop_totals_topic_page.html.
3. U.S. Department of Agriculture, Weather Bureau, Monthly Weather Review, Supplement No. 37, *The Ohio and Mississippi River Floods of January-February 1937*, June 1938.
4. Indiana Department of Natural Resources, *Coordinated Discharges of Selected Streams in Indiana*, Indianapolis, Indiana, 1980.
5. U.S. Water Resources Council Bulletin No. 17, *Guidelines for Determining Flood Flow Frequency*, March 1976.
6. U.S. Department of the Interior, Geological Survey, Interagency Advisory Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, *Guidelines for Determining Flood Flow Frequency*, September 1981, revised March 1982.
7. U.S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook, Section 4,"Hydrology", August 1972.
8. U.S. Geological Survey, Floods in Indiana, Technical Manual for Estimating the Magnitude and Frequencies, 1974.
9. U.S. Department of Commerce, *Hydraulic Circular No. 4*, "Estimating Peak Rate of Runoff from Small Watersheds", 1965.
10. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Spencer County, Indiana, May1978.

11. U.S. Army Corps of Engineers, Louisville District, *Ohio River Newburgh Pool Reach Kentucky and Indiana*, Sheet 1 of 24, *Ohio River Uniontown Pool Reach Kentucky, Indiana, and Illinois*, Sheet 39 of 45, Scale 1:7200, Contour Interval five feet: August 1966.
12. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, County of Warrick, IN, February 3, 1983.
13. ---, Federal Insurance Administration, Flood Insurance Study, City of Boonville, IN, November 17, 1981.
14. ---, Federal Insurance Administration, Flood Insurance Study, Town of Newburgh, IN, November 17, 1981.
15. Indiana Department of Natural Resources, Division of Water, *General Guidelines For The Hydrologic-Hydraulic Assessment Of Floodplains In Indiana,* December 2002
16. Knipe, David, and Rao, A. R. *Estimation of Peak Discharges of Indiana Streams by Using the Log Pearson III Distribution*, Purdue University, School of Civil Engineering, Joint Transportation Research Program, Project No. C-36-620, File No. 9-8-15, 2005.
17. Sherman, J. O., *Computer Applications for Step-Backwater and Floodway analyses Users' Manual*, U. S. Geological Survey Open-File Report 76-499, 1976.
18. U. S. Water Resources Council, *Guidelines for Determining Flood Flow Frequency: Bulletin 17B of the Hydrology Committee*, March, 1976.
19. U. S. Army Corps of Engineers, *HEC-RAS River Analysis System*, Davis California, 2004.
20. U.S. Department of Agriculture, Soil Conservation Service, Central Technical Unit, *Technical Release No. 20, Computer Program for Project Formulation –Hydrology*, May 1965.
21. U.S. Army Corps of Engineers, Hydrologic Engineering Center, *Computer Program 723-X6-L202A HEC-2 Water-Surface Profiles*, Davis, California, November 1976.
22. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Unincorporated Areas of Warrick County, Indiana, March 1978.
23. State of Indiana, Natural Resources Commission, *Flood Plain Management Rule-1, Guidelines for the Delineation of Floodways and Flood Hazard Areas*, March 1974.
24. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Vanderburg, County, Indiana, Unincorporated Areas, March 1982.
25. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Henderson County, Kentucky, March 1980.
26. ---, Flood Insurance Study, Unincorporated Areas of Daviess County, Kentucky, September 1980.
27. U.S. Army Corps of Engineers, Water Resources Development by the U.S. Army Corps of Engineers in Indiana, January 1979.

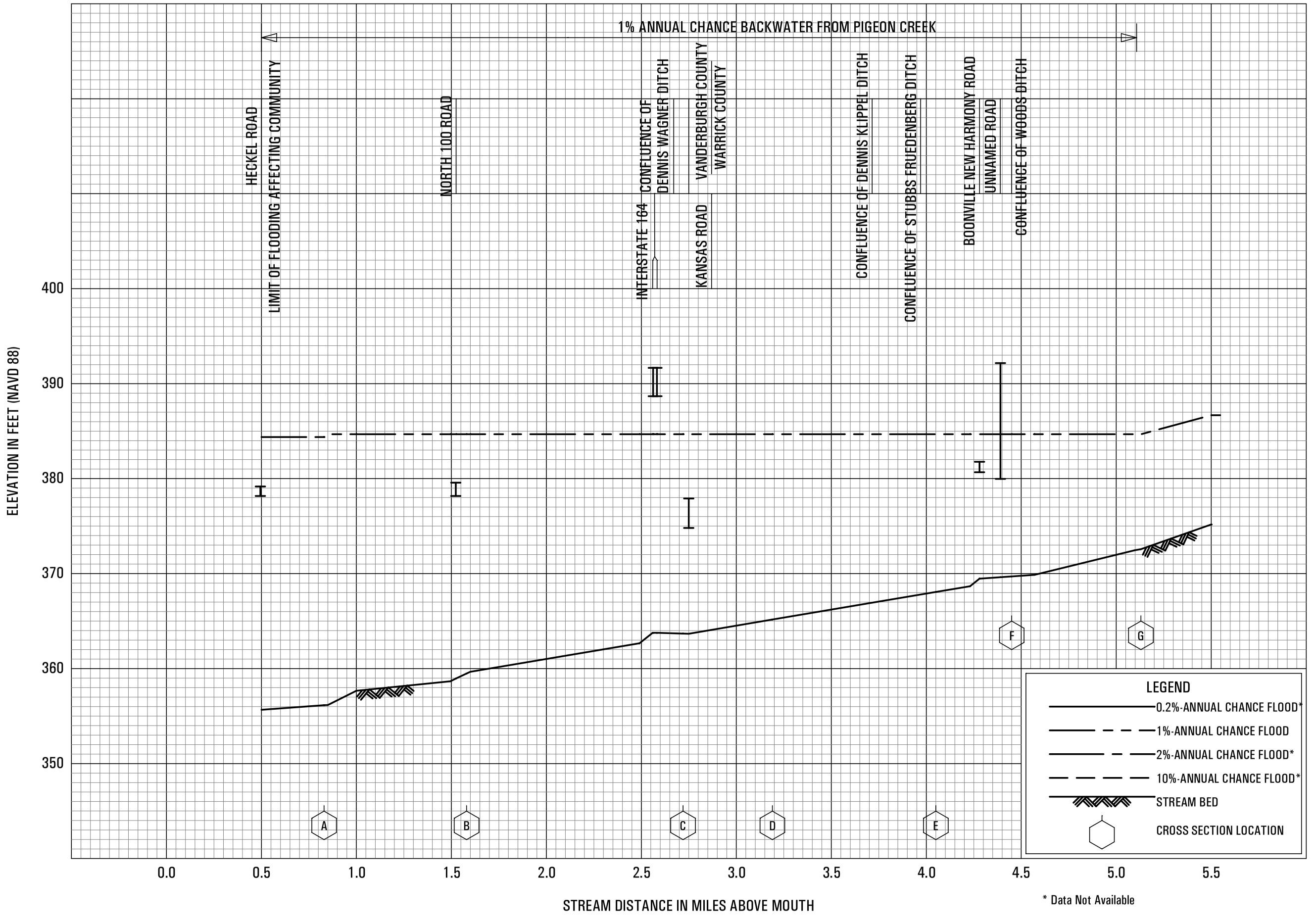
COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Boonville, City of	December 28, 1973	May 28, 1976	May 17, 1982	None
Chandler, Town of	January 9, 1974	July 11, 1975	September 28, 1979	None
Elberfeld, Town of	N/A	None	N/A	None
Lynnville, Town	TBD	None	TBD	None
Newburgh, Town of	November 2, 1973	May 11, 1976	May 17, 1982	None
Tennyson, Town of	February 1, 1974	June 18, 1976	TBD	None
Warrick, County of (Unincorporated Areas)	March 24, 1978	None	May 17, 1982	February 3, 1992

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY

WARRICK COUNTY, IN (ALL JURISDICTIONS)

COMMUNITY MAP HISTORY



FLOOD PROFILES

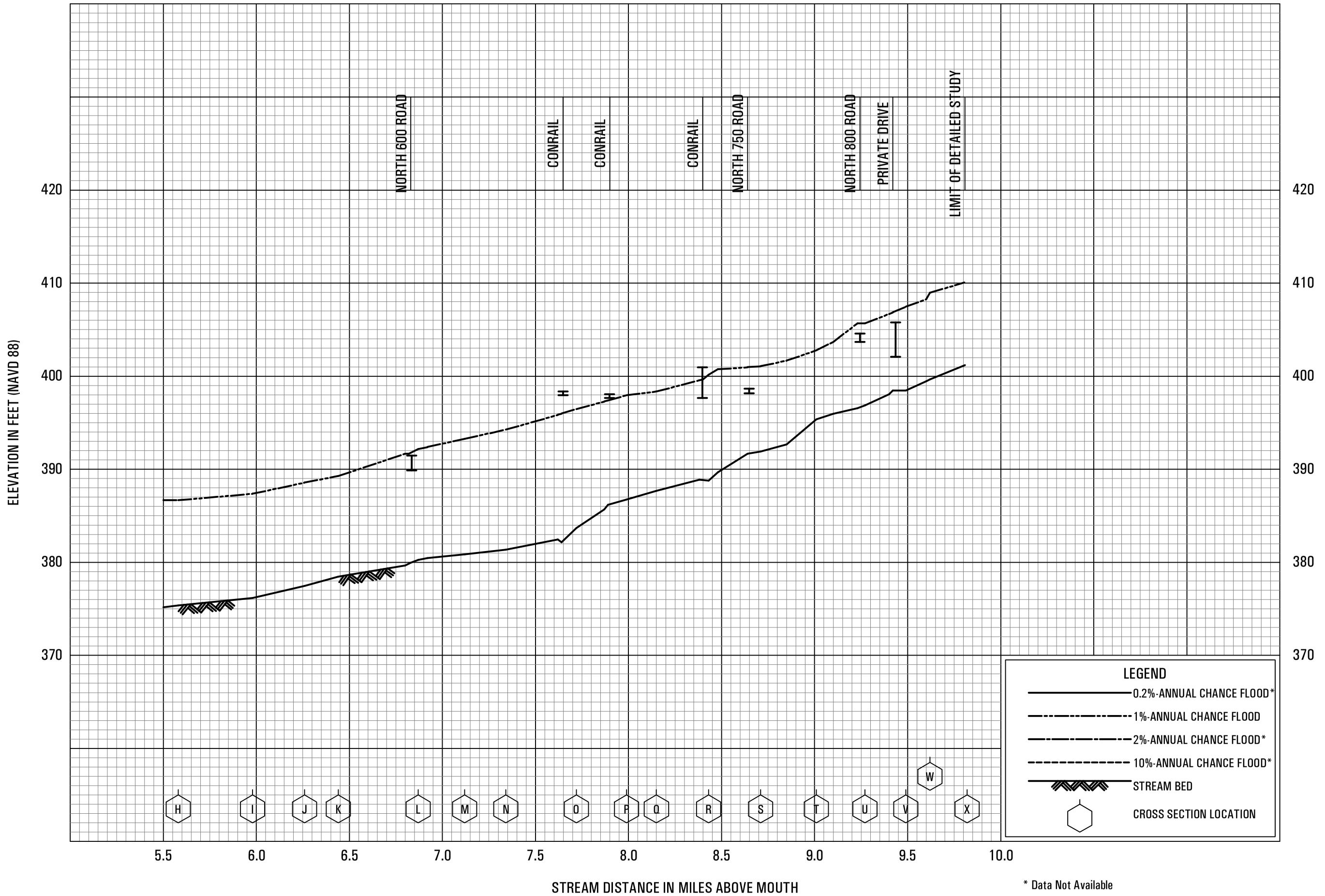
BLUEGRASS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

01P



* Data Not Available

FLOOD PROFILES

BLUEGRASS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

02P

ELEVATION IN FEET (NAVD 88)

370 380 390 400

STREAM DISTANCE IN MILES ABOVE MOUTH

12.25 12.50 12.75 13.00 13.25 13.50 13.75 14.00 14.25 14.50 14.75 15.00

A B C D E F G H I

LIMIT OF DETAILED STUDY
NORFOLK SOUTHERN RAILWAY

NORFOLK SOUTHERN RAILWAY
CONFLUENCE OF TRAYLOR DITCH

STATE HIGHWAY 62

NORTH 250 ROAD

LIMIT OF DETAILED STUDY

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

370 380 390 400

03P

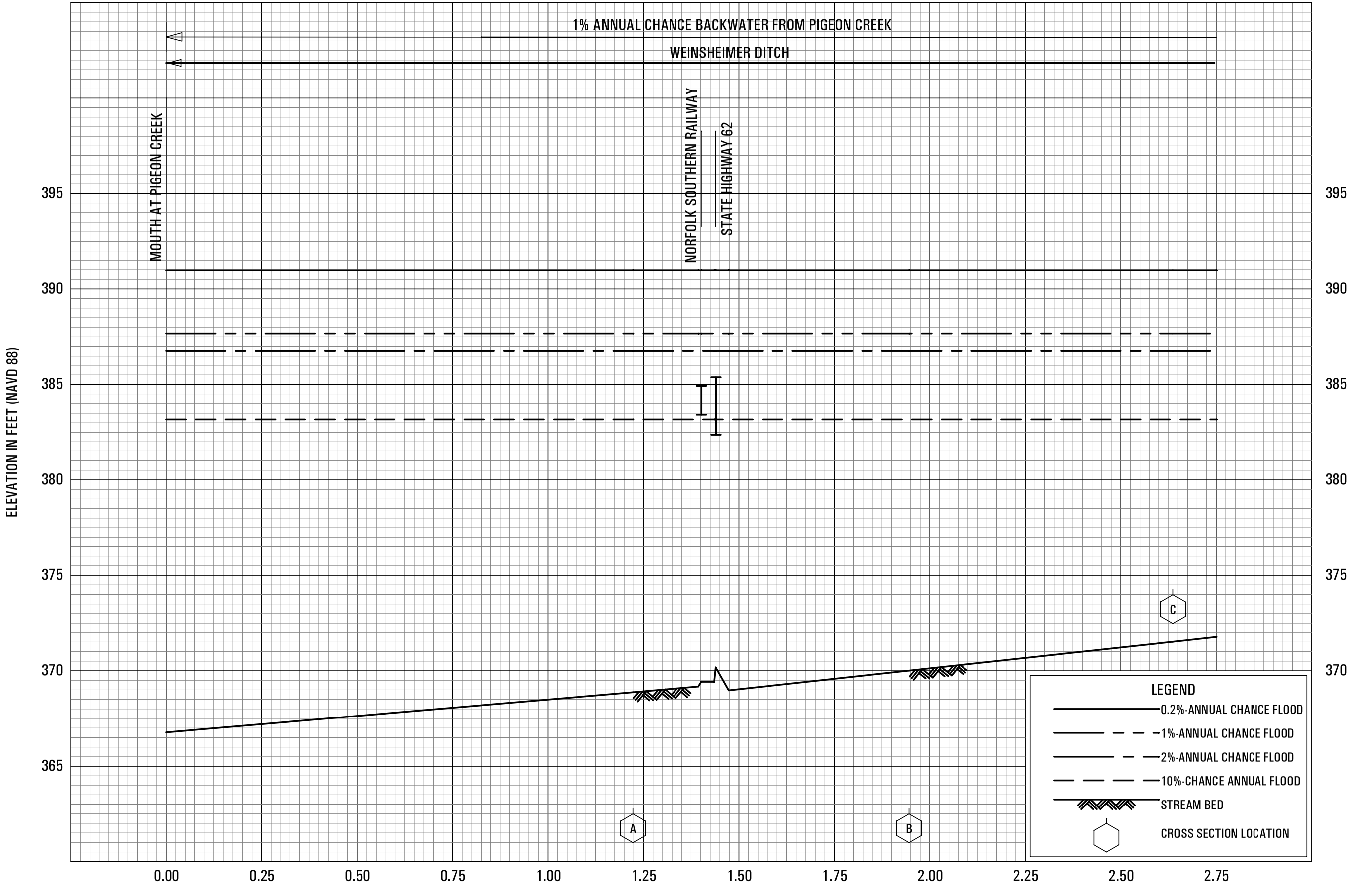
FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

FLOOD PROFILES

CYPRESS CREEK



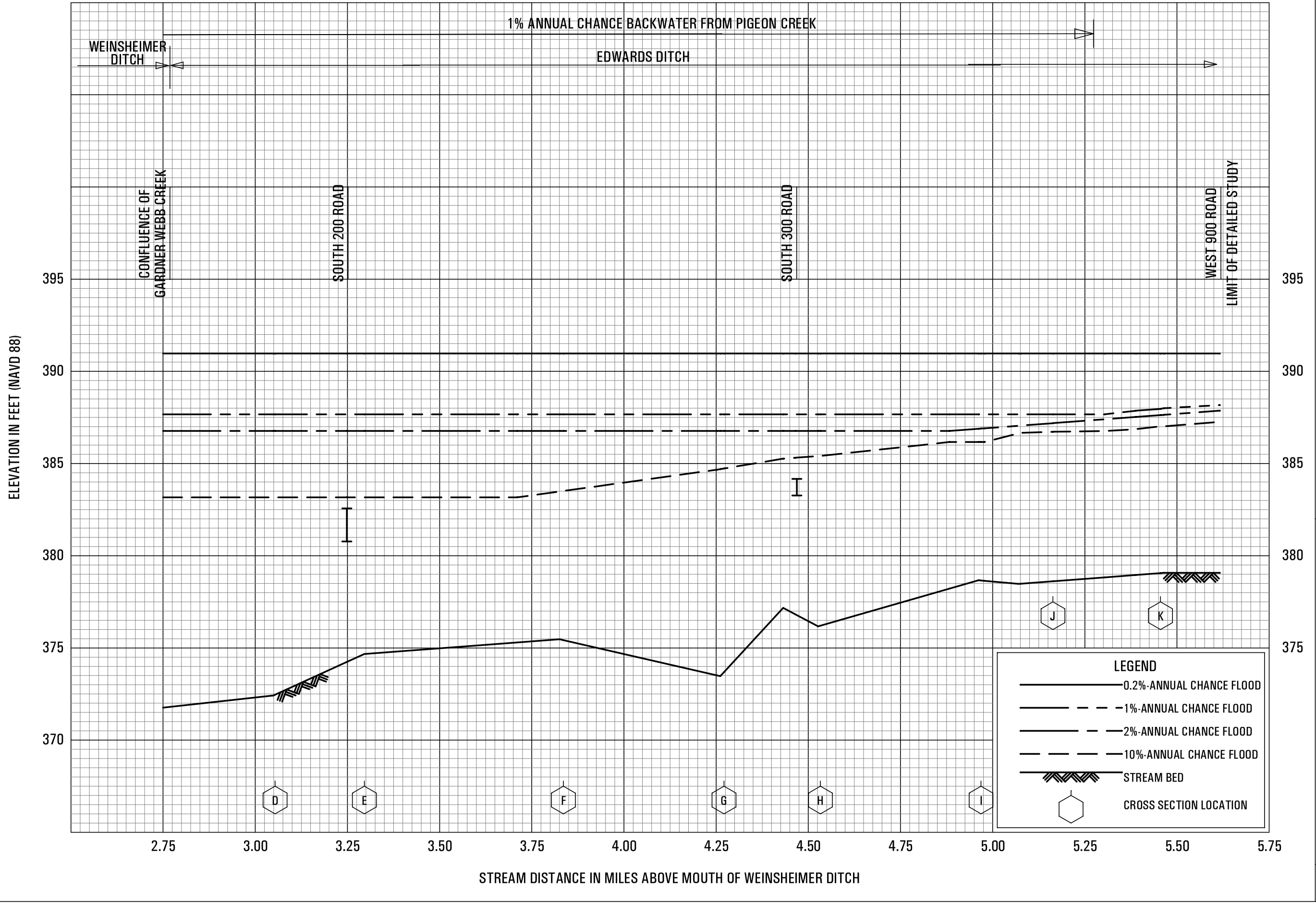
FLOOD PROFILES

EDWARDS DITCH - WEINSHEIMER DITCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS



FLOOD PROFILES

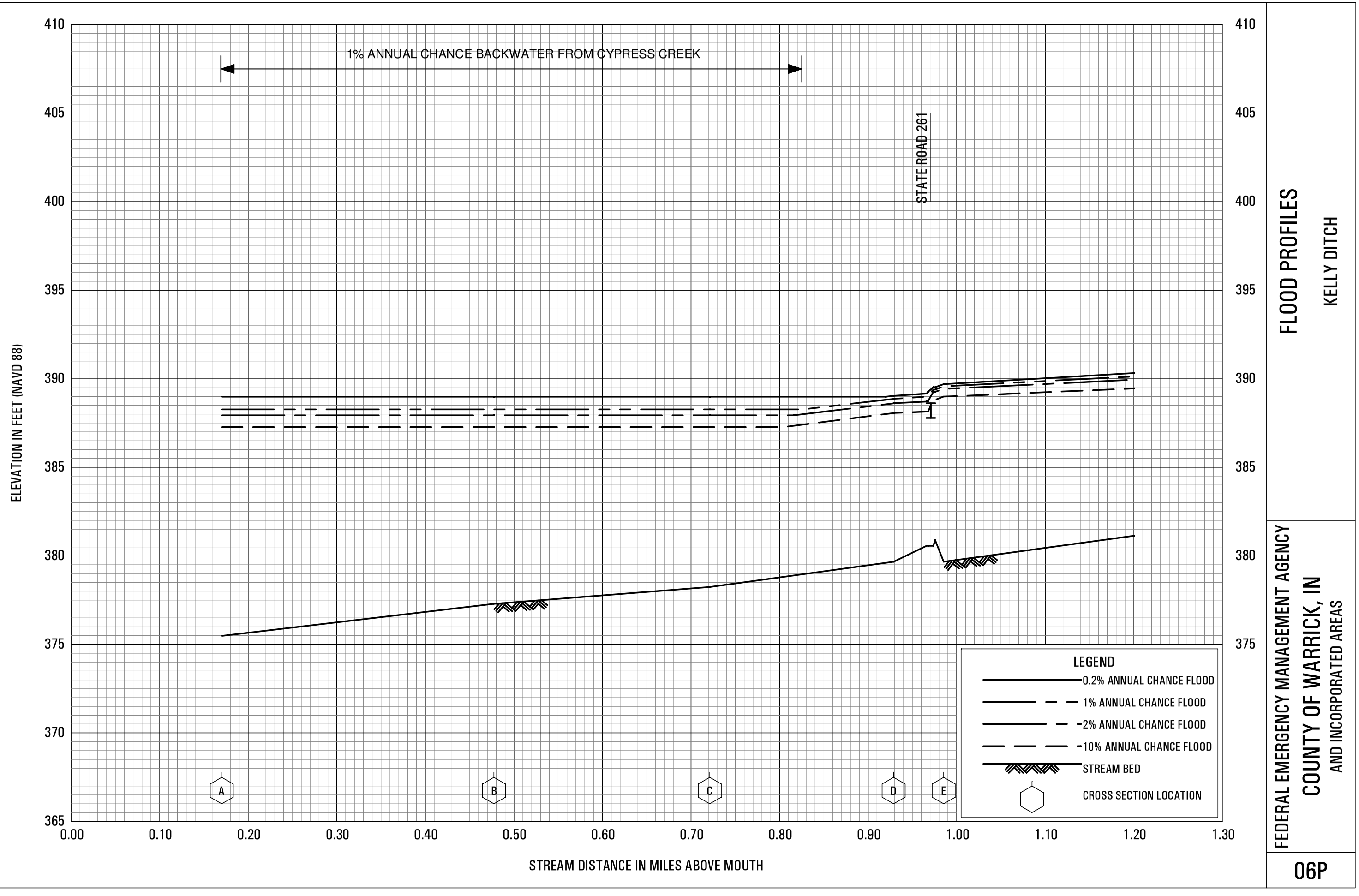
EDWARDS DITCH - WEINSHEIMER DITCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

05P



FLOOD PROFILES

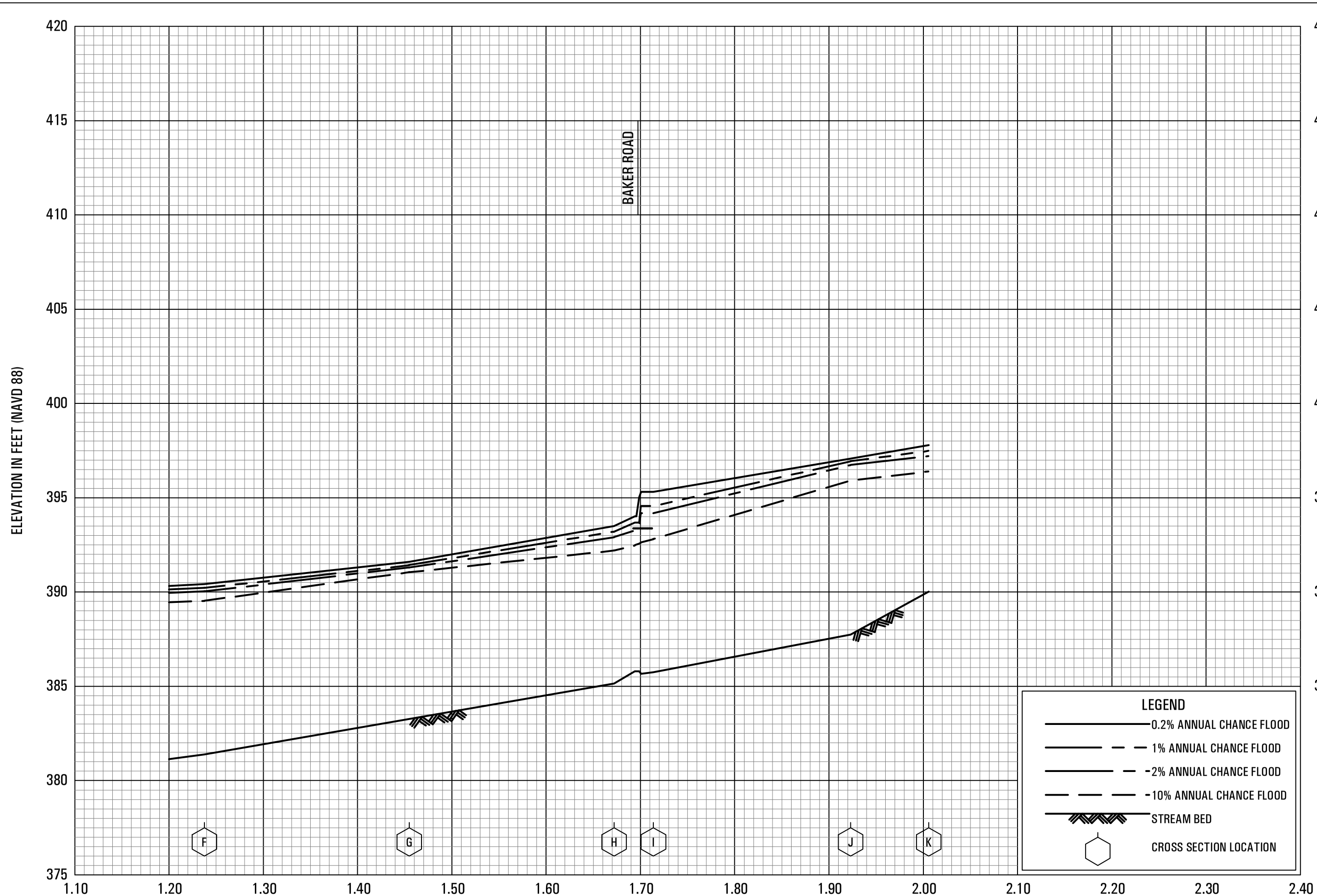
KELLY DITCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

06P



FLOOD PROFILES

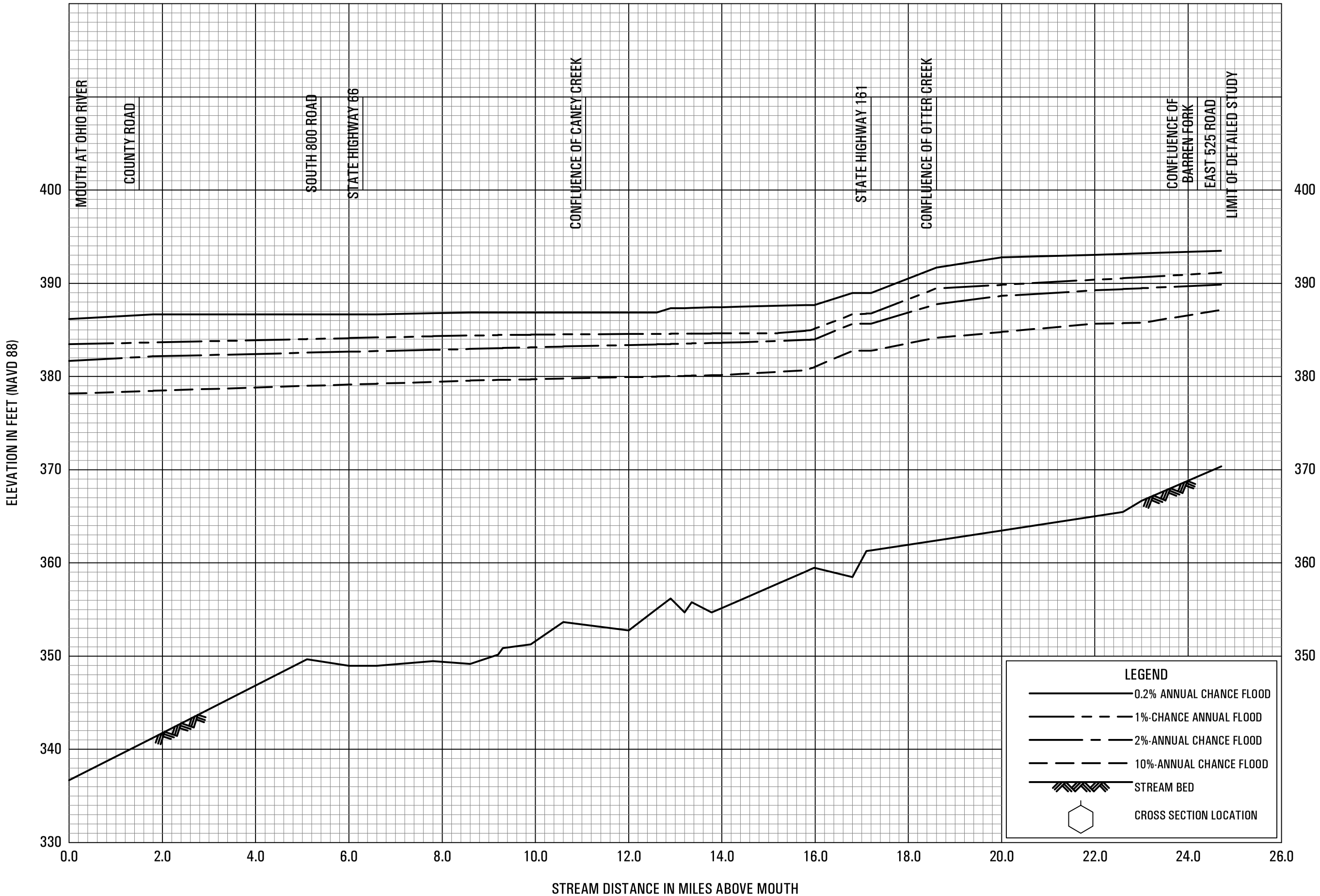
KELLY DITCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

07P



FLOOD PROFILES

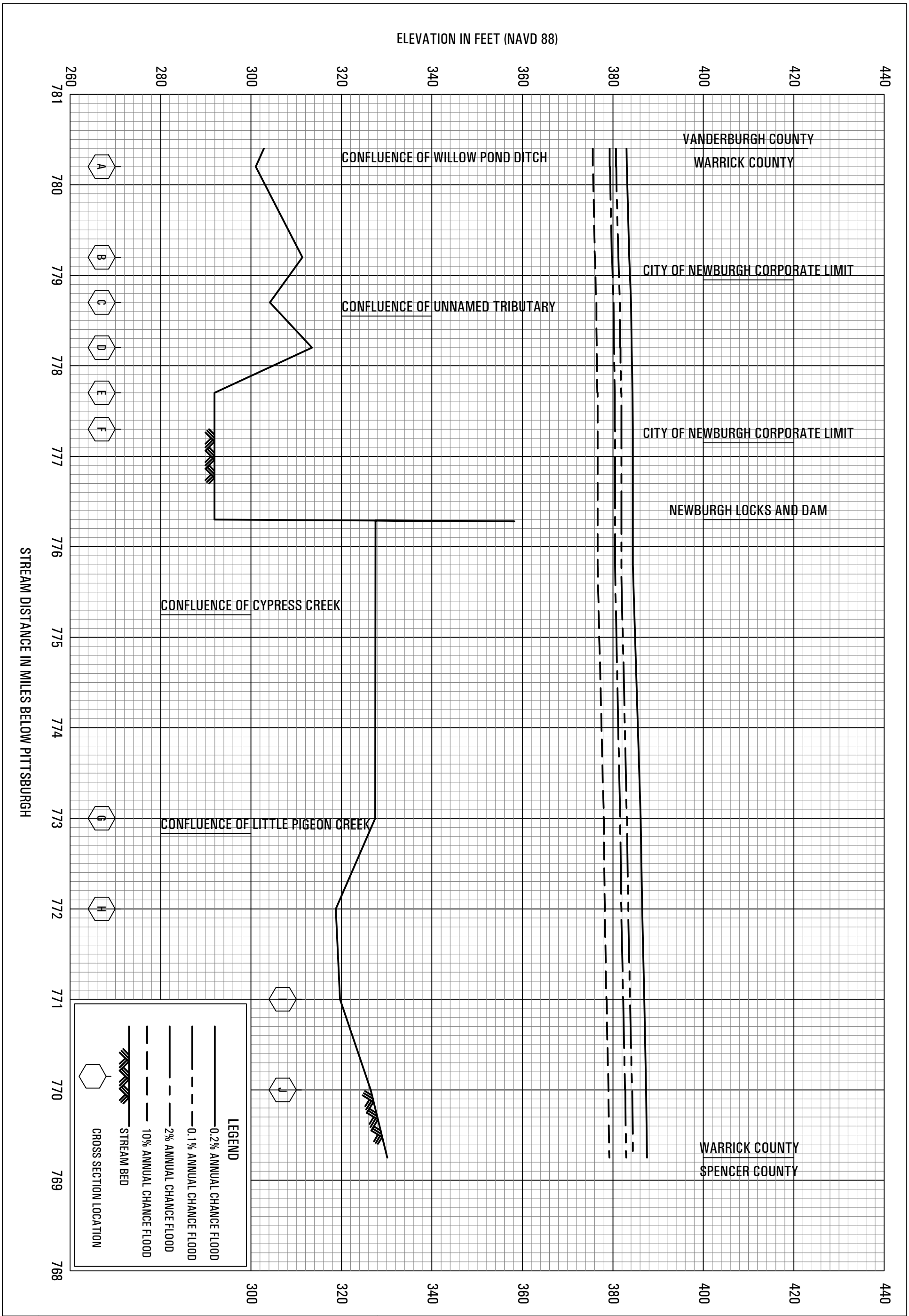
LITTLE PIGEON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

08P



09P

FEDERAL EMERGENCY MANAGEMENT AGENCY

WARRICK COUNTY, IN

AND INCORPORATED AREAS

FLOOD PROFILES

OHIO RIVER

ELEVATION IN FEET (NAVD 88)

350 360 370 380 390 400

STREAM DISTANCE IN MILES ABOVE MOUTH

12 13 14 15 16 17 18 19 20 21 22

LIMIT OF FLOODING AFFECTING COMMUNITY
INTERSTATE 64
VANDERBURGH COUNTY
WARRICK COUNTY
WARRICK COUNTY
VANDERBURGH COUNTY
VANDERBURGH COUNTY
WARRICK COUNTY
VANDERBURGH COUNTY
WARRICK COUNTY
WEST 1025 ROAD
CONFLUENCE OF WEINSHEIMER DITCH
CONFLUENCE OF BARNES DITCH
NORTH 50 ROAD
AMAX COAL CORPORATION RAILROAD
AMAX COAL CORPORATION RAILROAD
CONFLUENCE OF SQUAW CREEK
NORTH 250 ROAD
LIMIT OF DETAILED STUDY

A B C D E F G

LEGEND
0.2%-ANNUAL CHANCE FLOOD
1%-ANNUAL CHANCE FLOOD
2%-ANNUAL CHANCE FLOOD
10%-ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION

360 370 380 390 400

10P

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

FLOOD PROFILES

PIGEON CREEK

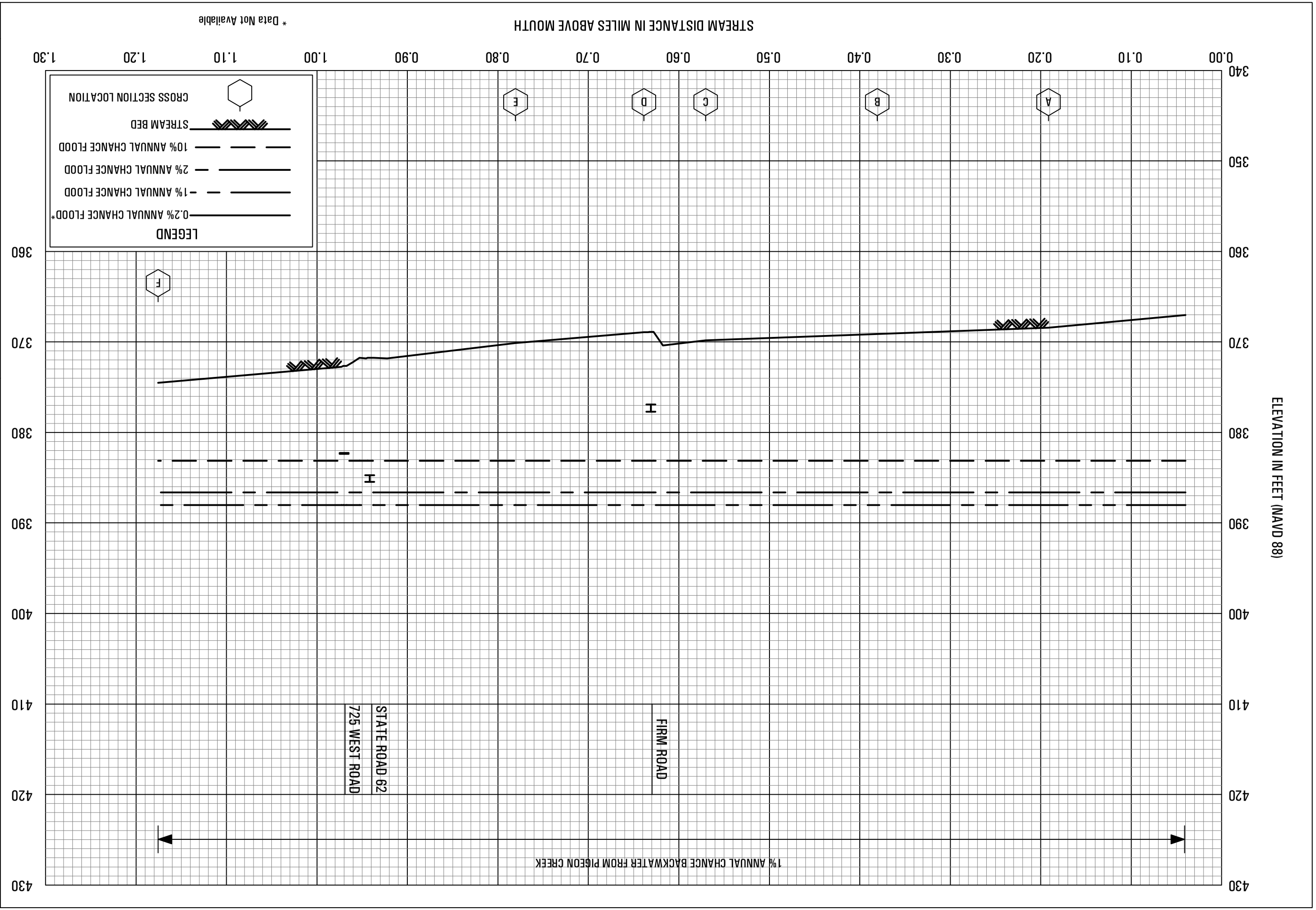
FEDERAL EMERGENCY MANAGEMENT AGENCY

WARRICK COUNTY, IN

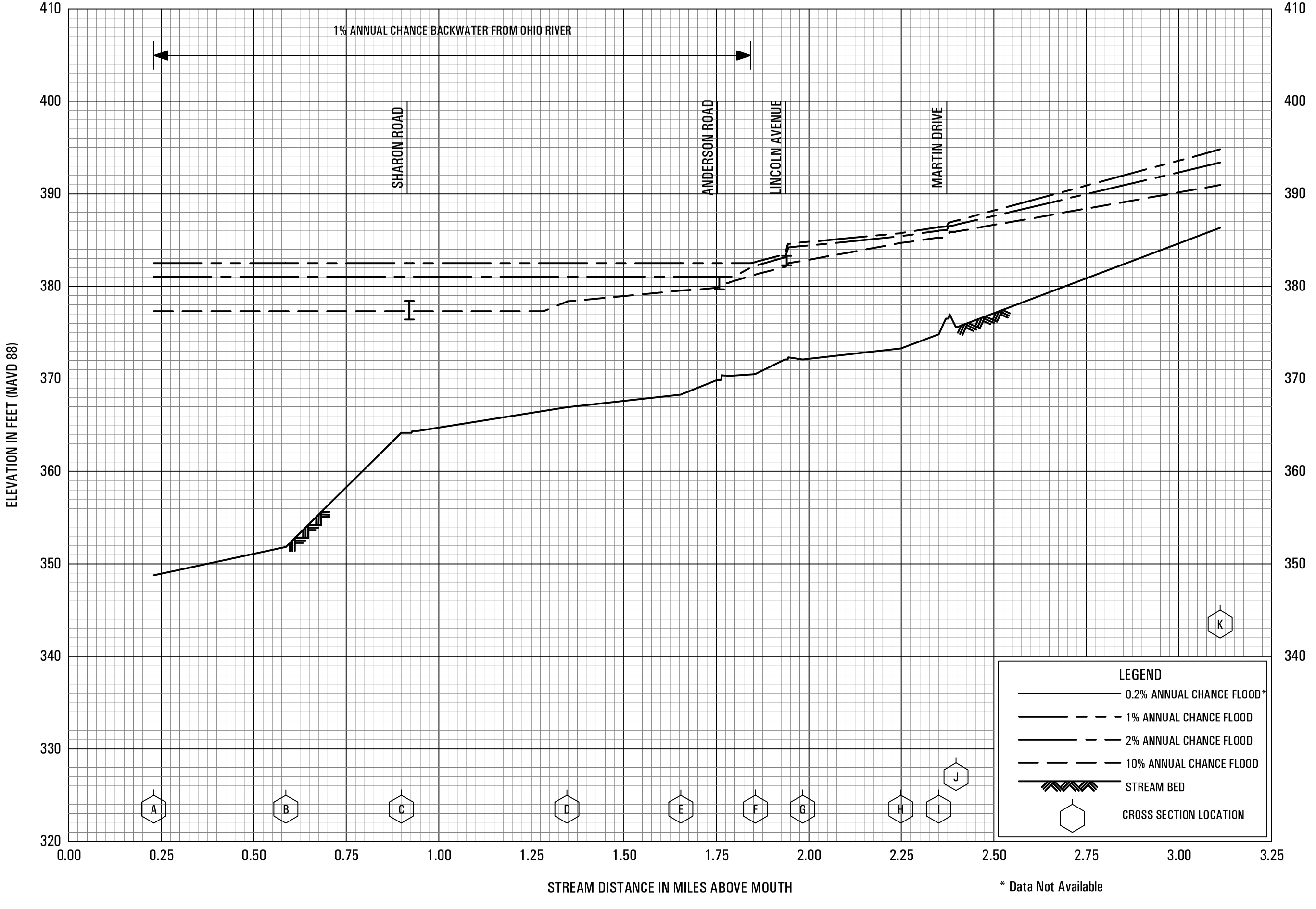
AND INCORPORATED AREAS

FLOOD PROFILES

STOLLBERG DITCH



11P



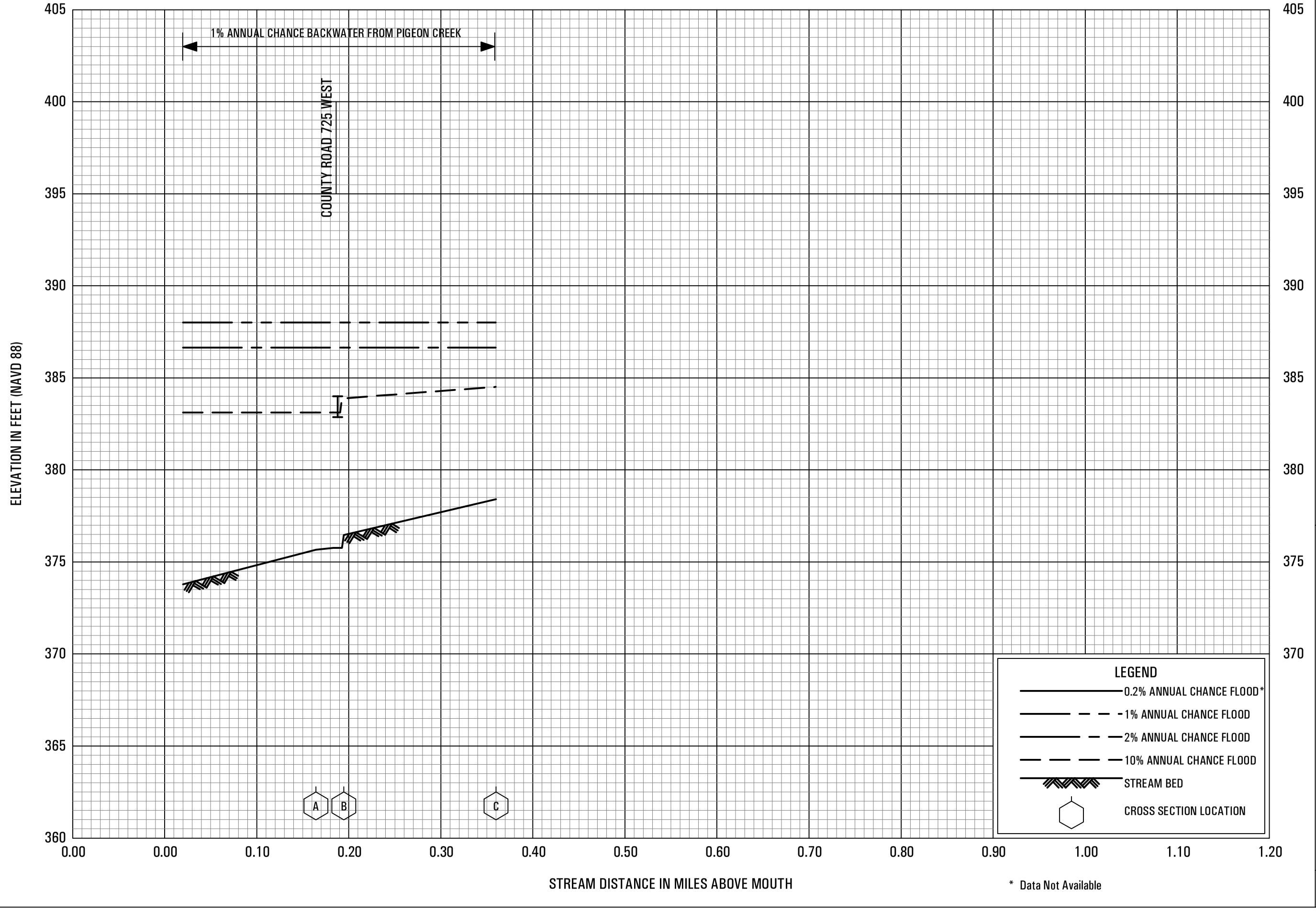
FLOOD PROFILES

SUMMER PECKA DITCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

WARRICK COUNTY, IN

AND INCORPORATED AREAS



STREAM DISTANCE IN MILES ABOVE MOUNTH

* Data Not Available

FLOOD PROFILES

WHITTAKER DITCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF WARRICK, IN

AND INCORPORATED AREAS

13P